

## 4-NITROPHENOL

4-Nitrophenol is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 100-02-7

$\text{NO}_2\text{C}_6\text{H}_4\text{OH}$

Molecular Formula:  $\text{C}_6\text{H}_5\text{NO}_3$

4-Nitrophenol is a colorless to slightly yellow crystal with no odor but a sweet, then burning taste (HSDB, 1991). It is moderately soluble in cold water and carbon disulfide, and soluble in alcohol, chloroform, acetone, pyrimidine, toluene, hot benzene, hot water, ether, fixed alkali hydroxide solutions, and carbonates. It sublimes and is slightly volatile with steam (HSDB, 1991). 4-Nitrophenol, if mixed with diethyl phosphite, may explode when heated. When it is heated to decomposition, it emits toxic fumes of nitrogen oxides (Sax, 1989).

### Physical Properties of 4-Nitrophenol

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Synonyms: 4-hydroxynitrobenzene; p-nitrophenol

Molecular Weight:	139.11
Boiling Point:	279.0 °C
Melting Point:	113 - 114 °C
Density/Specific Gravity:	1.27 at 120/4 °C (water = 1)
Vapor Pressure:	0.001 mm Hg at 25 °C
Log Octanol/Water Partition Coefficient:	1.91
Conversion Factor:	1 ppm = 5.69 mg/m <sup>3</sup>

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(Howard, 1990; HSDB, 1991; Merck, 1989; U.S. EPA, 1994a)

## SOURCES AND EMISSIONS

### A. Sources

4-Nitrophenol is used as a chemical intermediate in the production of methyl and ethyl parathion, N-acetyl-p-aminophenol dyestuffs, and leather preservatives (HSDB, 1991). It has been detected in the exhaust of motor vehicles and as an impurity in the parathion formulation Thiophos (Howard, 1990).

## B. Emissions

No emissions of 4-nitrophenol from stationary sources in California were reported, based on data obtained from the Air Toxics “Hot Spots” Program (AB 2588) (ARB, 1997b).

## C. Natural Occurrence

No information about the natural occurrence of 4-nitrophenol was found in the readily-available literature.

## **AMBIENT CONCENTRATIONS**

No Air Resources Board data exist for ambient measurements of 4-nitrophenol. The United States Environmental Protection Agency (U.S. EPA) reports concentrations of 4-nitrophenol from a 1984 study in Portland, Oregon. The mean ambient concentration of 4-nitrophenol was 24 nanograms per cubic meter (ng/m<sup>3</sup>) (U.S. EPA, 1993a).

## **INDOOR SOURCES AND CONCENTRATIONS**

No information about the indoor sources and concentrations of 4-nitrophenol was found in the readily-available literature.

## **ATMOSPHERIC PERSISTENCE**

Based on its vapor pressure, 4-nitrophenol is expected to exist in the gas phase in the atmosphere (as has been observed by Herterich and Hermann, 1990). Gaseous 4-nitrophenol will be removed from the atmosphere by gas-phase photolysis, reaction with the hydroxyl radical, and wet and dry deposition. The hydroxyl radical reaction is expected to be slow, and wet and dry deposition may be important (Herterich and Hermann, 1990). A more recent study has reported an estimated atmospheric lifetime for 4-nitrophenol of 1 to 2 months with dinitrophenols as reaction products (Kao, 1994).

## **AB 2588 RISK ASSESSMENT INFORMATION**

4-Nitrophenol emissions are not reported from stationary sources in California under the AB 2588 program. It is also not listed in the California Air Pollution Control Officers Association Air Toxics “Hot Spots” Program Revised 1992 Risk Assessment Guidelines as having health values (cancer or non-cancer) for use in risk assessments (CAPCOA, 1993).

## HEALTH EFFECTS

Probable routes of human exposure to 4-nitrophenol are inhalation, ingestion, and dermal contact (U.S. EPA, 1994a).

**Non-Cancer:** 4-Nitrophenol induces methemoglobin formation. Inhalation or ingestion of 4-nitrophenol may cause headache, drowsiness, nausea, and cyanosis. Contact with the eyes may cause irritation. Respiratory effects, an increase in methemoglobin, effects on the liver, and corneal opacity were reported in studies of acute exposure to 4-nitrophenol in rats (U.S. EPA, 1994a).

The U.S. EPA has determined that there are inadequate data for the establishment of a Reference Concentration (RfC) for 4-nitrophenol. The U.S. EPA is currently reviewing the Reference Dose (RfD) for 4-nitrophenol. No information is available on adverse reproductive or developmental effects of 4-nitrophenol in humans, with limited information in animals (U.S. EPA, 1994a).

**Cancer:** No information is available on the carcinogenic effects of 4-nitrophenol in humans or animals. The International Agency for Research on Cancer and the U.S. EPA have not classified 4-nitrophenol for potential carcinogenicity (IARC, 1987a; U.S. EPA, 1994a).

